arranged along mutually perpendicular sets of axes to define a matrix display having a display plane. Rotary drive shafts extend through the display element parallel to the display surfaces, and each display element includes clutch structure comprising frustoconical clutch members received in frustoconical apertures formed in the display element and spring biased to normally coupled the display element for rotation with the drive shaft extending therethrough. Abutment surfaces corresponding to the display surfaces project from the lower end of each display element, and a stop arm is associated with each display element for selective actuation to terminate rotation of the display element with a predetermined display surface situated in the display plane. The first display surfaces all of the display elements may be utilized in combination to form a dedicated sign and the second and third display surfaces of each display element may comprise contrasting colors, in which case the second and third surfaces of the display elements are utilized to form a desired sign by means of a matrix display.

Romney, U.S. Pat. No. 4,197,527 describes an apparatus and method for presenting information over a display area, using a group of contiguous or substantially adjoining modules, which essentially cover the area. Each module is made up of contiguously arranged elements, capable of presenting alternatively either a luminous (highly visible) or a non-luminous (much less visible) aspect. By selectively operating or energizing chosen elements in groups within each module, characters or symbols are presented which, collectively over the group of modules, presents the information to be displayed. Each module comprises a mounting base and an associated printed circuit board, referred to as a satellite board, having conductive element connected to each element of the module so that each element may be activated or energized, or deactivated selectively. The modules, in turn, are mounted so that the satellite board is connected electrically to a higher order control master or major printed circuit board. The latter is controlled, in turn, by mechanical or electronic means to selectively energize or activate the desired elements in all the modules, thus to present the information to be displayed. Each element has an incandescent electric light or a rotatable part having luminous and non-luminous aspects. Accessory means for changing color or, surface texture or reflective characteristics, etc., can be applied to each element or in selected elements and/or modules; similarly, background surfaces appearing between elements may be changed in color, aspect, etc. Special combination connector conductor means are provided between individual elements and the module base and other connectors are provided between modules and larger units, including the necessary conductive components to connect electrically the master board or circuit with satellite or module circuits. Novel aspects of connector and mounting devices are an important feature of the invention.

Kluiters, U.S. Pat. No. 4,214,390 describes a decorative panel assembly which includes a backing or supporting panel and a second or facing panel spaced from the backing panel. The facing panel includes a plurality of circular apertures therein and a plurality of spheres are loosely held hostage between the panels, the spheres each having a portion extending through the apertures. The spheres are supported such that they are each freely rotatable, and one hemispherical portion of each of the spheres is one color and the other hemispherical portion of each of the spheres is a contrasting color. The decorative panels may be used to form a wall or large decorative surface incorporating a large number of the rotatable spheres and whereby visual patterns can be formed by rotating the respective spheres such that the desired colored portion of the sphere surface projects through the respective aperture.

Kent, U.S. Pat. No. 4,775,862 describes a display member comprising a housing having a chamber with a viewing face and a lamina member movably mounted within the chamber to be movable into a first position in which one face of the member is in face to face contact with the viewing face and a second position in which the one face of the member is out of contact with the viewing face and the other face is in face to face with a rear face of the chamber spaced rearwardly from the viewing face, a drive being provided to produce an attractive and/or repulsive force between the housing and the member to move the member from the first or second position to the other position wherein no external energy need be provided to maintain the member in the first or second position, an opaque fluid filling the chamber.

Black, U.S. Pat. No. 4,912,442 describes a display apparatus comprising a plurality of rotationally mounted display elements arranged into a matrix of rows and columns, the axes of rotation of said display elements being perpendicular to each associated column and parallel to each associated row, respectively, said display elements each including first and second display faces perpendicular to one another and joined along respective adjacent edges, for providing a desired arrangement of said display faces at the front of said display apparatus; first and second ramp surfaces are rigidly connected along inside edges of and extending substantially perpendicularly away from a back surface of said first and second faces, respectively, opposite the edges joining said first and second display faces, respectively; and an actuator assembly is mounted for bidirectional movement along a path perpendicular to the planes of rotation of said display elements at the rear of said display apparatus, for stroking selected ones of said first and second ramp surfaces with sufficient force to cause the associated display elements to rotate 90 degree for changing the pattern of associated first and second faces at the first of the display.

The prior art teaches a bi-stable electro-magnetically operated display member, decorative panel assembly, compressive information display system, changeable display apparatus, illuminated display apparatus, a stipple member, pulse scanned reflective display, scanned electromechanical alphanumeric display, multi-element changeable sign display, display apparatus with spheres mounted on rods, multi-element display apparatus for displaying different patterns or information, and a changeable indicator for display, but does not teach an electromagnetically operated, scanning Braille carriage scanning a membrane and adjusting Braille characters using a revolving belt. The present invention fulfills these needs and provides further related advantages as described in the following summary.

SUMMARY OF THE INVENTION

The present invention teaches certain benefits in construction and use which give rise to the objectives described below.

A Braille reading apparatus has a base unit presenting a planar upfacing surface, and a traveling Braille character carriage. A cover unit is engaged with the base unit and provides a flexible membrane covering the upfacing surface and the carriage. The character carriage is enabled for moving across the base unit and provides plural character read units in linear sequence between its opposing ends. Each of the read units provides Braille character presentation in contact with an underside of the membrane, whereby, a page of Braille is readable through tactile contact, moving